Cogitare Enfermagem

STRATEGIES FOR REDUCING MEDICATION ERRORS DURING HOSPITALIZATION: INTEGRATIVE REVIEW

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ABSTRACT
Objective: to synthesize the knowledge related to strategies to reduce medication errors during the hospitalization of adult patients. Method: integrative literature review carried out in October 2020 through the search for publications in electronic databases: Web of Science, Pubmed, Cumulative Index of Nursing and Allied Health Literature, Latin American and Caribbean literature in Health Sciences and Google Scholar. Results: sample composed of 12 studies, whose strategies for the reduction of medication errors were presented according to the categories: involvement of the clinical pharmacist in clinical activities, implementation of information technologies, educational strategies mediated by simulation and games, and workload reduction. Conclusion: associated with technologies, the involvement of the clinical pharmacist in the medical and nursing team will result in improvements in the reduction of adverse medication events and in the quality of care provided to the patient.

DESCRIPTORS: Medication errors; Patient Safety; Hospital Medication Systems; Safety Management; Nursing Care.

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INTRODUCTION

International health organizations consider patient safety as a priority indicator of quality of care. Global efforts target the reduction and control of the risks arising from safety incidents[1]. The events that cause harmful and preventable consequences include medication errors. Identifying and reporting medication errors is essential to safeguard patient safety[2], as they can occur at all stages of the drug use process: in the prescription, dispensing and administration, in addition to situations of medication reconciliation, and in improper patient monitoring[3].

Medication errors are preventable and considered one of the important causes of health problems worldwide, as they result in high mortality rates, prolong the hospitalization period, affect treatment, and drive up health care expenses[4]. According to an analysis by the World Health Organization (WHO), published in 2017, the global costs associated with medication errors are approximately 42 billion USD per year[5-6].

This data on the costs of medication errors has generated global initiatives towards a goal of reducing serious and avoidable medication-related harm by 50%, to the extent that WHO's Global Patient Safety Challenge elected "medication without harm" as its third Global Challenge, aiming to expose and discuss the weaknesses in health systems and establish strategies to prevent such events[5]. Multiple factors trigger medication errors, part of which originate in miscommunication among health professionals and management and organization problems[7]. Psychosocial factors play a crucial role in the emergence of these errors though[8].

Medication errors can acknowledgedly bring about temporary or permanent patient damage. The results deriving from these errors can be minimized or reversed though if the error is identified early[9]. Therefore, the US National Coordinating Council for Medication Error Reporting and Prevention (NCC-MERP) recommends that health organizations develop systems and processes to collect information necessary for analyzing reports of medication errors as soon as possible after the event[9].

As important as early action to repair damage caused by medication errors is to implement strategies to identify and minimize factors predisposing to risks. Several strategies to prevent these errors have been studied and used in all stages of the medication use chain, including as the use of health information technologies, which significantly reduce risks[10].

Another widely disseminated strategy among nursing staff is the use of the "five rights of medication administration", updated to the "nine rights of medication administration" (right patient, right drug, right route, right time, right dose, right documentation, right action, right form and right response)[11-12]. Despite the fact that they do not fully guarantee the prevention of errors, their systematic adoption can significantly limit part of the events[12].

In view of the above, knowing strategies to reduce medication errors is essential and can provide useful and necessary information for public and private hospitals to overcome these problems by adopting effective practices that minimize harm to patients and the system. In this context, this study aimed to synthesize knowledge related to strategies to reduce medication errors during the hospitalization of adult patients.

METHOD

Integrative literature review study, developed to gather and synthesize research results, in a systematic way, regardless of the design used. It was developed based on

the following stages: definition of the guiding question, search for primary studies in the databases, extraction of data from studies, evaluation of selected primary studies, analysis and synthesis of included studies, and presentation of the knowledge synthesis[13].

To formulate the guiding question of the research, the PICO[14] strategy was used, whose acronym represents: P (population) - adult patient; I (intervention) - strategies to prevent medication errors; C (comparison) - did not apply; and O (outcome) - medication error reduction. Thus, the following question was obtained: what are the strategies used to reduce medication errors during the hospitalization of adult patients?

The following inclusion criteria were adopted: studies that presented a strategy for reducing medication errors during the hospitalization of adult patients, published in Portuguese, English and Spanish, in a time frame between January 2015 and October 2020, in order to discuss the scientific evidence produced in the last five years. Articles that did not answer the research question, those performed with pediatric patients, theses, dissertations, editorials, review articles, opinions, reflections or comments, letters to the editor, expanded abstracts and publications in annals of scientific events and books were excluded.

The descriptors "Medication errors, Hospitalization, Patient safety and Medication errors reduction" were used in English and combined with the Boolean operators OR and AND in the databases.

The searches were carried out independently by two researchers, in October 2020, in the following electronic databases: Web of Science, Pubmed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Latin American and Caribbean Literature in Health Sciences (LILACS) and Google Scholar. The findings were 2,551 studies, seven of which were available in the Web of Science, 2,535 na PubMed, six in CINAHL, three in LILACS and none in Google Scholar.

After the search, the data was exported to the reference manager Web EndNote for the deletion of duplicates. Twelve duplicate records were identified. Subsequently, two independent reviewers read the titles and abstracts, who excluded 2,516 records that did not answer the guiding question, totaling 23 articles for reading the full text. At this stage, two reviewers disagreed on three articles, requiring the collaboration of a third reviewer for the final decision, totaling a final sample of 12 articles included in the review (Figure 1).
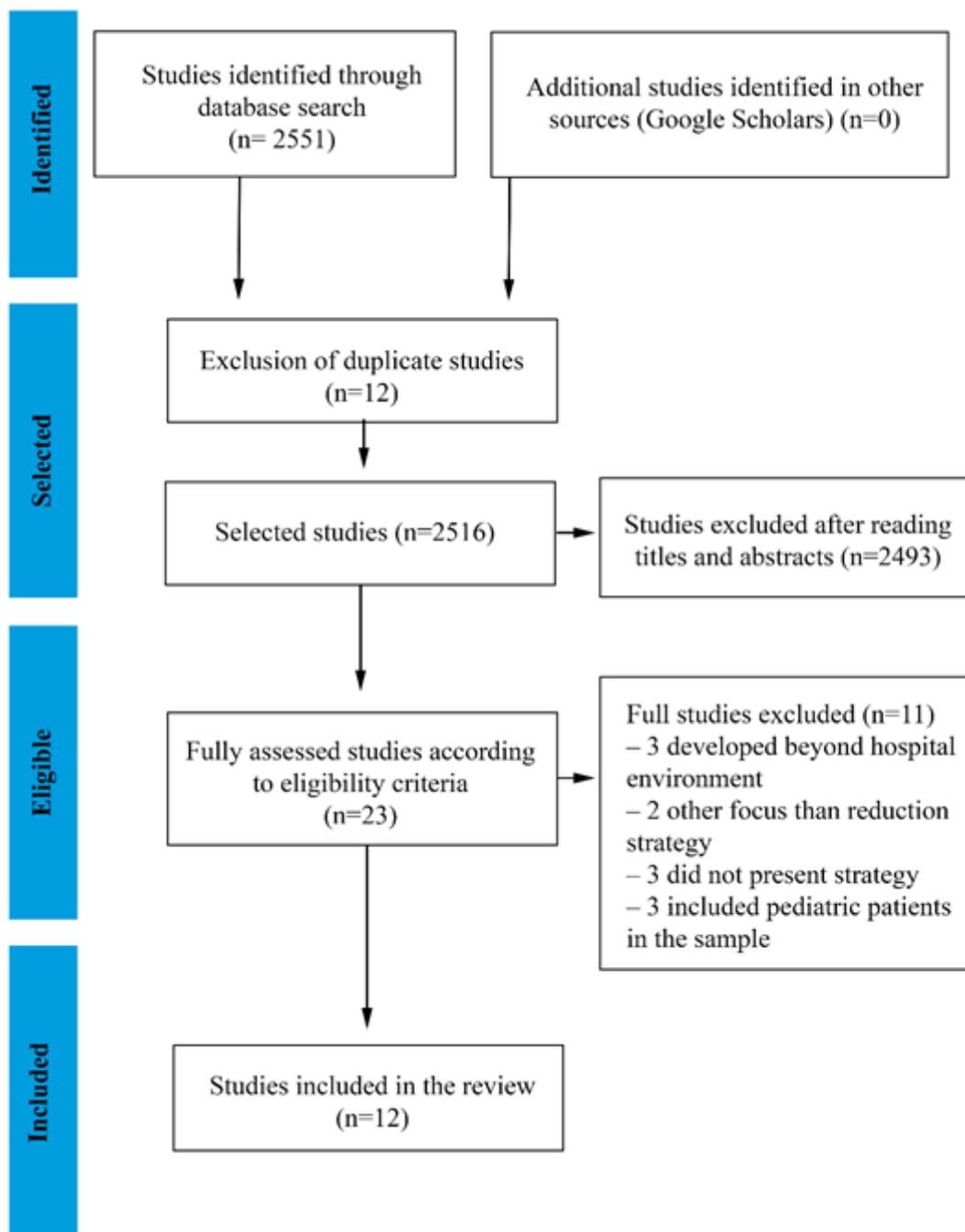
Figure 1 - Identification flowchart of the primary studies included in the review. Ribeirão Preto, SP, Brazil, 2020
Source: Authors (2020).

To extract the data for the qualitative synthesis, a validated instrument was used[15] and adapted for this research, which included: identification of the article, authorship, year, language, methodological characteristics, data treatment, interventions and results related to the reduction of medication errors during the hospitalization of adult patients. For each study analyzed, a table was elaborated with the year of publication, the country, the place of research, the journal and area of specialty and the level of evidence. To classify the level of evidence, the seven-level evidence hierarchy was used[16]. The synthesis of the evidence was organized descriptively.

RESULTS

The Integrative review presented here resulted from 12 articles that met the previously established inclusion criteria, ten of which were published in English and two in Portuguese (Table 1).

Table 1 - Articles included in the integrative review, according to journal, country of publication, year of publication, place of research, area of specialty of the journal and level of evidence. Ribeirão Preto, SP, Brazil, 2020

Periodical / country of development / year	Research site	Journal specialty / level of evidence
Therapeutics and Clinical Risk Management, China, 2015[17]	Teaching hospital	Interdisciplinary (VI)
PloS One, France, 2015[18]	Teaching hospital, orthopedic surgical unit	Interdisciplinary (VI)
Pharmacy Practice, USA, 2015[19]	For-profit community hospital affiliated with the health system of the Hospital Corporation of America (HCA)	Pharmacy (IV)
Latin American Journal of Nursing (Rlae), Brazil, 2016[20]	Public hospital	Nursing (VI)
European Journal of Hospital Pharmacy (EJHP), Denmark, 2016[21]	Teaching hospital, hematological	Hospital pharmacy (IV)
Journal of Research in Pharmacy Practice (JRPP), Iran, 2017[22]	Teaching hospital	Pharmacy (VI)
Epidemiology and Health, Iran, 2017[23]	Teaching hospital	Epidemiology and Public Health (VI)
PLoS One, France, 2017[24]	Teaching hospital	Interdisciplinary (IV)
BMJ Quality Improvement Reports, Netherlands, 2017[25]	Teaching hospital	Health (III)
Hospital Pharmacy, USA, 2018[26]	Teaching hospital	Pharmacy (IV)
Therapeutic Advances in Drug Safety, Australia, 2019[27]	Teaching hospital	Interdisciplinary (III)
Einstein (São Paulo), Brazil, 2019[28]	Teaching hospital	Health (VI)

Source: Authors (2020).

Regarding the place where the studies were developed, in ten articles, the data came from teaching hospitals affiliated to universities, one from a public hospital and one from a for-profit community-based hospital. In addition, ten studies were conducted in a single institution and two were multicenter studies.

Considering the year of publication, three articles were published in 2015, two in 2016, four in 2017, one in 2018 and two in 2019.

As for the specialty of the journal the articles were published in, four are from

interdisciplinary journals, three from pharmacy, two from general health, one from nursing, one from hospital pharmacy and one from public health and epidemiology. In terms of the levels of evidence, two articles were classified at level III, four at level IV and six at level VI.

Regarding the methodological detailing, only one of the selected articles adopted a qualitative approach with Graneheim content analysis; the others used a quantitative approach with cross-sectional design (one), observational before and after (two), prospective cohort (two), retrospective cohort (two), quasi-experimental (two) and intervention (two).

The strategies to reduce medication errors identified included the incorporation of electronic systems from the prescription to the medication administration, the collaboration of the pharmacist and family members in the medication administration and reconciliation process, the continuing education of the health team, as well as the use of a method based on collaborative team effort for better performance in the medication administration process (Table 2).

Table 2 - Articles included in the Integrative review according to the title and strategies found for reducing medication errors. Ribeirão Preto, SP, Brazil, 2020 (continues)

Article title	Strategies for reducing medication errors
Quality improvements in decreasing medication administration errors made by nursing staff in an academic medical center hospital: a trend analysis during the journey to Joint Commission International accreditation and in the post-accreditation era[17]	Three-and-a-half year intervention program focusing on medication errors, aiming for institutional accreditation by Joint Commission International (JCI)
Causes of Medication Errors in Intensive Care Units from the Perspective of Healthcare Professionals[22]	Computerized entry of the prescription order; identical format for writing the prescription; permanent education to the health team; effective human resource in care; collaboration of the pharmacist; involvement of family/caregivers in the medication reconciliation process in hospital.
Medication errors among nurses in teaching hospitals in the West of Iran: what we need to know about prevalence, types, and barriers to reporting[23]	Reduction of the nursing team's workload and implementation of permanent education programs for the health team.
An Observational Study of the Impact of a Computerized Physician Order Entry System on the Rate of Medication Errors in an Orthopaedic Surgery Unit[18]	A Computerized Physician Order Entry (CPOE) system associated with verification by the clinical pharmacist.
Improving medication safety: Development and impact of a multivariate model-based strategy to target high-risk patients[24]	A multivariate model to predict potential medication-related adverse events as a strategy to improve the allocation of the clinical pharmacist and subsequent patient safety.
The Role of Computerized Clinical Decision Support in Reducing Inappropriate Medication Administration During Epidural Therapy[26]	A support tool for clinical decision making incorporated into the Computerized Physician Order Entry (CPOE) system.
An automated medication system reduces errors in the medication administration process: results from a Danish hospital study[21]	An Automated Medication System - AMS integrates electronic medication administration records (eMARs) and barcode-assisted automatic dispensing (BCMA).

Impact of pharmacy-led medication reconciliation on medication errors during transition in the hospital setting[19]	Involvement of the clinical pharmacist in the medication reconciliation process during hospitalization
Pharmacist-assisted electronic prescribing at the time of admission to an inpatient orthopaedic unit and its impact on medication errors: a pre- and post intervention study[27]	Involvement of the clinical pharmacist in the medication reconciliation process during hospitalization and electronic prescription using eMMS (electronic medication management system) in hospitalized orthopedic patients.
Experiences with Lean Six Sigma as improvement strategy to reduce parenteral medication administration errors and associated potential risk of harm[25]	Hospital Improvement Program, Lean Six Sigma. Customized intervention for the problems: five-step cycle, DMAIC (define, measure, analyze, improve, control), with team training, routine changes in the medication administration process, posters and folders.
Implementing technologies to prevent medication errors at a high-complexity hospital: analysis of cost and results[28]	Integration of various technologies in the medication chain in the prevention of medication errors.
Risk factors for medication errors in the electronic and manual prescription[20]	Electronic prescription (EP) with support for clinical decision making X manual prescription (MP), identifying risk factors for medication errors.

Source: Authors (2020).

DISCUSSION

This integrative review allowed the identification of strategies to reduce medication errors during hospitalization of adult patients. The countries where the analyzed and synthesized studies were undertaken demonstrated great variation, showing the importance and concern the theme represents and hospital institutions' great interest in mitigating the occurrence of medication errors.

The pharmacist's involvement in the daily clinical activities at inpatient units stands out, ranging from admission to discharge, acting in the medication reconciliation process during hospitalization, monitoring and intervening in the entire medication administration process. The pharmacist's activities in clinical practice are fundamental with a view to rational medication use, contributing to the achievement of expected therapeutic outcomes while minimizing medication error risks[18-19,22,24,27].

It is important to recall that, in 1999, the report entitled "To err is human: building a safer health system", by the Institute of Medicine (US) Committee on Quality of Health Care in America, described human errors in the health system and highlighted the importance of the pharmaceutical professional in medication reconciliation and prescription[27].

Other studies also reveal the significant impact of pharmacists' interventions on the use of computerized electronic prescription (Computerized Physician Order Entry-CPOE), and medication management systems (Electronic Medication Management System-EMMS). With the support of these technological tools, improvements have been observed in patients' clinical outcomes due to the accuracy of the drug treatment, improvement in patient safety with the prevention of adverse events and, consequently, cost savings[19,27].

The implementation and/or improvements of information technologies were the most found strategies in the studies evaluated, showing reduction in the medication error rates, facilitating interdisciplinary communication and reducing delays in the correction of prescriptions[18,20-22,26-28].

In some studies, the computerized physician order entry (CPOE) system was incorporated into clinical decision support modules and the electronic medication management system (EMMS). These support tools favored the integration of understandable and reliable pharmaceutical information, enabled access to data on possible drug interactions or adverse effects, enabling professionals to administer medications safely and accurately. The authors of the studies indicate the use of technological tools to obtain satisfactory results for patient safety, both in the reduction of incorrect medications and of adverse drug events[26-27].

According to the studies, the CPOE favors the reading and understanding of the prescription, reducing its illegibility and eliminating erasures. The CPOE focuses key information on the prescription (route, dilution, dose, frequency), name of the active ingredient, and complete prescriptions. In one of the studies, a decrease in cases of allergies was verified. On the other hand, there was an increase in risk factors such as "lack of verification" and "lack of identification of the prescribing professional's professional registration number". It should be acknowledged, however, that when computerization is well used, it promotes easy and accurate records by the health team professionals, especially doctors and nurses, increasing patient safety and reducing risk factors for such situations. Thus, the CPOE alone does not eliminate the possibility of medication errors[20].

Continuing education was listed as a strategy in the selected studies[17,22-23,25,28]; when conducted as a constant practice, it favors the prevention of errors and offers safety to the professional[25].

Educational strategies mediated by simulation, games and others prove to be important for improving multidisciplinary communication, developing the safety culture, integrating the use of technological tools and also for reducing medication-related incident rates[17,22]. It is suggested that managers should increasingly explore and value this low-cost strategy to prevent medication administration errors and ensure patient safety.

Among the studies analyzed, the reduction of the workload and sufficient nursing staff dimensioning were reported as strategies in reducing medication errors[17,22-23]. In a study conducted in an intensive care unit, it was identified that the heavy workload due to the large number of patients, in addition to fatigue, sleep and stress, aggravated the occurrence of different errors in the medication administration process[23].

Appropriate staff dimensioning is fundamental for safe care, and managers and the institution are responsible for granting favorable working conditions to the human resources at the services. Appropriate workloads and staff dimensioning, in accordance with the patients' number and needs, play an important role in the reduction of medication errors, as well as a lower incidence of occupational health problems[22-23].

Hospital quality programs were listed as a strategy to prevent medication errors in the studies[17,25]. Some intervention programs focusing on medication errors include organizational, information technology, educational, and process optimization-based measures. Programs such as the Joint Commission International (JCI) and the Lean Six Sigma method are developed in hospital institutions, and can intensify the quality of health systems, improve the organizational climate, satisfaction, safety and knowledge of professionals and, consequently, increase their capacity and motivation to prevent medication errors and achieve successful practices to improve the quality of health care.

The importance of this theme in nursing education should be highlighted, with a view to efforts for future professionals to get to the job market prepared to guarantee the quality of health systems, especially with regard to the ability to prevent medication errors. Academic investments have been reported in the literature with scripts to assess safety in medication administration by nursing students[29], as well as the patients' involvement and participation as stakeholders in watching over their own safety in the reception of care[30]. To the extent that better prepared professionals and increased health literacy become available, we will have more favorable conditions for health organizations to be successful

in their quality and patient safety programs.

CONCLUSION

The findings showed that communication technologies in health care have become important tools for the multiprofessional team, increasing the quality of care provided or enhancing the reliability of the interventions needed.

Associated with the technologies, the pharmacist's involvement in the daily activities in the inpatient units, with the medical and nursing staff, will result in improvements in the reduction of medication-related adverse events and in the quality of care.

In combination with these two strategies, quality-focused continuing education programs are developed for the multiprofessional team, and the hospital management needs to heed and commit to the employment conditions of its staff, the most important capital of the institution it manages; workload reduction and sufficient nursing staff dimensioning cannot be ignored when seeking to compose and elect strategies to reduce medication errors.

The analysis of the selected studies highlights the need to continuously seek out the results of studies undertaken in favor of ensuring patient safety and eliminating failures in the medication administration process. The strategies listed in the studies are mutually complementary and demonstrate the importance of multidisciplinary research on this topic.

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